

VI. *Observations on the Economy of Pompilus punctum and other Hymenoptera.* By F. SMITH, Esq.

[Read 1st August, 1853.]

SOME time ago, Mr. W. Thompson, Director of the Natural History Department at the Crystal Palace, submitted to my examination a number of mud or clay cells, evidently the production of some insect; at that time I expressed an opinion that they were constructed by some Diplopterous insect, probably an *Odynerus*; these cells were found at the beginning of November, on the top of a straw bee-hive, worked into the layers, the bee-hive having been covered with an old cloth and a milk pan; others were found in the back part of an old mirror. These discoveries were made by the Rev. W. Delmar, in his garden at Elmstone Rectory, near Canterbury.

At the expiration of some weeks I observed in the glass-topped box, in which I had placed the cells, a black species of *Pompilus*, running about with great activity. The insect proved to be a male, and I at once recognized the species to be the *P. punctum* of Fabricius. I was much pleased at this, as I felt a certainty of having an opportunity of settling beyond a doubt what was the female of that species. On the following day, the 15th of June, two more males came forth; no further development took place until the expiration of ten days, when, to my astonishment, or rather satisfaction, for I had long suspected some mistake respecting the species, two females appeared, and proved to be the *P. petiolatus* of Van der Linden.

Shuckard, in his Essay on the Fossorial *Hymenoptera*, states, that he is unacquainted with the female of *P. punctum*, which Van der Linden considered to be the *P. petiolatus*, and Shuckard describes a different male as that of the species. Mr. Desvignes, who now possesses the Shuckardian collection, placed in my hands the types, but there was no male amongst the specimens of *P. petiolatus*, and we are left in ignorance of the male described in the Essay; but in all probability it was only a variety of the "*punctum*," which would in some instances answer the description of Shuckard, the white markings on the face being, I have observed, frequently more or less obliterated. Be this as it may, the *P. petiolatus* of Van der Linden is certainly the female of *P. punctum*.

In the first volume of the "Transactions" of this Society will be found a most able and interesting Paper on the habits of the fossorial *Hymenoptera*, by Mr. Shuckard, who there most suc-

cessfully confutes the theory of St. Fargeau, who observing that, amongst this tribe, many species were destitute of cilia on their anterior tibiæ, and also of spines externally down the posterior pair, suggested the probability of such species being parasitic; the *P. punctum* is one of the species thus circumstanced, and here we have a clue to the complete explanation of the apparent anomaly—an insect which constructs mud cells has no need of the cilia or spines, so useful to an insect which forms its burrows in sand; the cilia on the anterior tibiæ forming as it were a brush, with which to sweep out the particles of sand, from time to time, in forming its burrow, and the spines, placed exteriorly on the posterior tibiæ, which in burrowing are placed against the sides of the tunnel, which gives the creature a purchase whilst scratching, or disengaging the sand with its mandibles.

The structure of the *Pompilus* in question naturally calls to the mind of an Hymenopterist another insect, which long suffered under the imputation of being a parasite—I allude to *Pelopæus*. My friend, the late Edward Doubleday, had, it is true, ever since his return from America, asserted the contrary, but it remained for Mr. Gosse, in the second volume of the "Zoologist," to publish one of the most amusing and graphic sketches of insect architecture which I ever had the good fortune to fall in with; this set the matter, as regards the *Pelopæi*, at rest; and if any be wanting, I think the discovery of the *P. punctum* being a constructor of mud cells, similar to those of *Pelopæus*, furnishes decisive testimony against the theory of St. Fargeau.

My own experience does not furnish a single instance of parasitism in the whole tribe of fossorial *Hymenoptera*;\* and, if I am not trying your patience too far, I will take this opportunity of adding the results of my own observations in further elucidation of this interesting subject. I will, in the first instance, make a few observations upon the various insects mentioned in Mr. Shuckard's paper above alluded to.

The first insect I would observe upon is the *Sapyga quadriguttata*, which I have captured conveying its prey, a small Lepidopterous larva, and have also found its cells, formed in a sand-bank, filled with similar larvæ; when the larva of *Sapyga* is full fed, it spins a tough brown cocoon, very similar to that of an *Osmia*. The genus *Trypoxylon*, were St. Fargeau's theory correct, would be parasitic, but I have repeatedly observed the different species conveying their prey, and have also repeatedly bred the insects.

\* I here speak of British insects; the *Scoliadæ* are known to be parasitic—and I suspect that *Tiphia* is the parasite of *Aphodius*. The *Mutillidæ* are also said to be parasitic.

Their choice of situation is varied; a decayed post, a bramble stick, or a bank of light earth; in the latter situation I once discovered a complete colony. The prey of all the British species of this genus is spiders.\*

*Pemphredon*, and all the species of *Diodontus*, provision their own nests, as well as the insects forming the genus *Passalæcus*; most of these species prey upon *Aphides*. I shall pass over the various species of bees, remarked upon by Shuckard, as I intend to enter upon the subject at some length in a Monograph on the British *Apidæ*. I would, in conclusion, however, make a few remarks upon the solitary wasps, which have their tarsi and tibiæ destitute of spines and cilia. *Odynerus parietum* is an insect very variable in its habits.† I have repeatedly obtained its nests, having found its cells formed in an excavated bramble-stick, which was lined with a thin layer of mud or agglutinated sand; at another time it chooses a decayed rail or board; then again a hole in the mortar of a wall; and on one occasion, in an old lumber room of an outhouse, I found several cells placed longitudinally in a lady's fan, which lay half open upon a shelf. These variations in situation induce me to believe that it seldom, if ever, forms its own burrow; but, like most of the insects of the tribe destitute of the usual fossorial appendages, it constructs its cells in any suitable situation prepared and adapted to its purpose. I have frequently observed insects similarly constructed to the *P. punctum*, &c. in the act of closing their burrows, but I never detected one in the act of excavating. Mr. Shuckard, in the notes appended to his paper on these insects, mentions the fact of these insects closing the entrance to their burrows, and follows this up by an observation, that their eggs are speedily hatched, and that they change into a pupa before the winter, in which state they lie dormant until the following spring. This is an incorrect supposition; observation has led me to believe that no Hymenopterous insect passes the winter months in the pupa state; a change from that to the perfect state either takes place, or they remain as larvæ until the return of spring. I tried the experiment of freezing the larva of *Anthophora Haworthana*, and, on the return of spring, the larvæ which had been frozen so hard that I could snap them in two, were amongst the first to change to the pupa state, and so on to perfect insects.

\* Vide Kennedy in Lon. and Edinb. Phil. Mag. Jan. 1837, p. 16.

† Ibid. p. 18.